

THERMAL PAIRING CORRELATIONS AND ITS EFFECT ON THE WIDTH OF GIANT DIPOLE RESONANCE AT LOW TEMPERATURE

Nguyen Dinh Dang

*RI-Beam Factory Project Office, RIKEN, 2-1 Hirosawa, Wako, 351-0198 Saitama,
Japan*

Thermal pairing correlations in stable and unstable nuclei are studied within the modified BCS theory [1], which is the limit of the modified Hartree-Fock-Bogoliubov theory at finite temperature T [2] when the pairing parameter is constant.

The numerical calculations of thermodynamic quantities within the modified BCS theory are carried out for ^{120}Sn and neutron-rich $^{68-84}\text{Ni}$ isotopes. The results show that the superfluid - normal phase transition is completely washed out. It is also found that the two-neutron separation energy for ^{84}Ni drops to zero at $T \simeq 0.8$ MeV.

The theory is applied to study the pairing effect on the width of the giant dipole resonance (GDR) at finite temperature. The calculations are carried out within the Phonon Damping Model [3] for ^{120}Sn including the neutron thermal pairing gap determined from the modified BCS theory. It is shown that the effect of thermal pairing causes a smaller GDR width at $T \leq 2$ MeV as compared to the one obtained neglecting pairing. This improves significantly the agreement between theory and experiment including the most recent data point at $T = 1$ MeV [4].

References

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